An Architecture for Policy-based C2 Decision Support Systems

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Ontology-based Policy Approach

- Policy creator and consumer share a common terminology
- Policy creator defines policy in those terms
- Consumer expresses conditions and receives response in those terms
- Inference capability allows detection of applicable policies which do not explicitly address the exact set of conditions specified by the querying consumer
- Specifying new terms and relationships allows new types of policy to be created and consumed.
Example: Policy-based Reasoning for Targeting Decision Support

A Mission Problem...
Flooded by data, the targeting officer must make critical decisions rapidly in a complex and highly dynamic environment...

... and he must do so while considering a host of issues of varying relevance for a diverse set of forces.

Improving Mission Effectiveness With Cognitive Systems
Support the targeting officer with situation awareness by...
adding a cognitive decision aide...
to the existing warfighter toolset

using policy-based reasoning
adding the richness of semantic content...
to the existing information networks

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KAoS Service Overview

- General purpose ontology editor allows basic policy terms to be extended to a particular domain
- Disconnected operations supported by Ontology Server and specialized guard configuration
- KPAT editor provides edit capability in terms of the problem domain
- Policy server de-conflicts policy and distributes it to registered applications, tracking what each application has received.
Applications – C2 Targeting Decision Aid

- Agents brokering data from Cognitive Layer to Targeting Tool
- Ontology and Policies created to control agent behavior based on data content
- GIG Adaptor uses Jena with a separate, small ontology, SWRL rules, and SPRQL queries to identify new information in incoming GIG data stream
Adding Policy-based Filtering and Categorization to Existing HMI

- Contrast the relevant reports delivered to the Mission A-1 and the 1st/2nd MRR folders with the full received set of reports
- Policies used to require creation of mission folders and routing of messages to folders
The familiar trend: more info, more places, more speed. The tech gets better, but the problem keeps getting harder.

Solution: Use Cognitive Systems Technology to Make the Network Smarter.

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Integrating Policy-based Reasoning to Support the Operation of a MANET
RF Management
Testbed Architecture

- Apps on communications testbed to left
- Agents in grey
- fGraph and msgBroker track agent location and communication parameters to compute and simulate link behavior between agents
- Ontology and Policy servers use the admin bus for this demo
Operational Scenario: Redeploying UAV Asset for Emergency Aid

UAV Transitioning from Iraq to Turkey

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Questions?
Cognitive System IRAD: Making the Network System Smarter

<table>
<thead>
<tr>
<th>Year</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1863</td>
<td>lots of people, one weak, wired link</td>
</tr>
<tr>
<td>1917</td>
<td>lots of people, one weak, wireless link</td>
</tr>
<tr>
<td>1943</td>
<td>1 person, 1 weak wireless link</td>
</tr>
<tr>
<td>1953</td>
<td>Automated switching, many links, large staff</td>
</tr>
<tr>
<td>2003</td>
<td>1 person, many links, all dynamic</td>
</tr>
</tbody>
</table>

The familiar trend: more info, more places, more speed. The tech gets better, but the problem keeps getting harder.

Solution: Use Cognitive Systems Technology to Make the Network Smarter.

Human Reasoning + Machine Speed = Solution

Situation Understanding + Dynamic Collaboration + Force Effectiveness = Mission Assurance

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